PATHFINDER

An informal newsletter published for the GPS user community by PM GPS. Information presented is based on published and submitted news items of interest to the general user. Widest dissemination and reproduction is encouraged. Newsworthy items are solicited for inclusion. Editor Mr. Don Mulligan at PM GPS, Ft Monmouth NJ DSN 992-6137 or (732) 532-6137 or email: Donald.Mulligan@iews.monmouth.army.mil

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Next-Generation GPS Receiver DAGR Contract Awarded !

PM's Corner

I am pleased to report award of the DAGR production contract!

We are looking at 'fast-tracking' the rest of the acquisition process to get DAGR into soldier's hands as soon as possible with the least disruption to unit operations. DAGR joins PLGR as a military-rated handheld GPS receiver authorized for field use.

The DAGR has some new features not found in PLGR but they share a critical design feature not found in commercial GPS receivers: The ability to utilize the Precise Positioning Service (PPS) signal via COMSEC crypto-key.

PPS is the "magic bullet" that allows authorized users to operate reliably in an electronically challenged combat environment that could render commercial GPS receivers inaccurate or non-functioning.

PPS is your defense to the battlefield hazards of accidental and intentional jamming and spoofing. If you have any questions, contact me or my staff.

LTC Skip Harborth,

Product Manager,

Global Positioning System

Meet DAGR!

Dimensions: 1.5"deep, 3.5" wide 6.5" high
Weight: 1 lb with 4 batteries installed
Manufactured by Rockwell-Collins Inc.

DAGR Contract is Awarded to Rockwell Collins Inc.

Defense Advanced GPS Receiver (DAGR)

On October 24th, 2003, PM GPS presented a Final Decision Briefing for award of the DAGR production contract to the GPS Joint Program Office (JPO) Selection Authority who selected Rockwell Collins Inc. of Cedar Rapids, Iowa as the DAGR production contractor. This milestone event came after years of effort by joint– service personnel to define the requirement for a military next– generation handheld GPS receiver.

Prior to the award, the GPS JPO invested in an 14-month study to scope out the technical issues. This work helped to form the final definition of DAGR used for the competitive acquisition.

We salute the Rockwell Collins team of dedicated employees in Cedar Rapids and Coralville Iowa who share a common desire to support America's military forces.

In Step One of a two-step competitive acquisition, GPS JPO awarded contracts to two finalists (Rockwell –Collins and Raytheon) who delivered pre-production sample DAGR for evaluation under the First Article Test (FAT) evaluation phase. Soldiers were provided the opportunity to operate these candidate DAGR and their feedback was especially valuable as part of the evaluation criteria used by PM GPS in developing the Final Decision Briefing recommendations.

PM GPS is rapidly moving the DAGR acquisition to the next phase and will seek to expedite the process of Operational Testing (OT) which provides a final opportunity for technical and field testing before full-rate production begins.

Due to the intense desire to expedite fielding DAGR to deployed units who can make good use of its state-of-the-art features, PM GPS will lead a cooperative effort from all testing and approving agencies to establish a start-date for DAGR fielding as soon as it is prudent and feasible. A leading concern will be to schedule the fielding process with Major Commands so that the introduction of DAGR to replace PLGR can be accomplished with a minimum of impact on unit operations.

It was a long time in coming but the DAGR contract award brings us closer to the day that soldiers are equipped with state-of-the-art PPS-rated handheld GPS receivers.

Even as fielding DAGR begins, PM GPS will be working with many weapons system managers to swap DAGR-for-PLGR where PLGR is currently installed to provide GPS data to fielded weapons systems.

MAJ Bruce Ryba at Los Angeles DSN 833-0595

What Does DAGR Backward Compatibility Mean?

The concept means that DAGR should be easily substituted when it replaces an "installed" PLGR.

Although PLGR was designed to be handheld, it is used by many weapons systems as an "installed" source of GPS data. The **electrical** interface is standardized through the use of an Interface Control Document or ICD. ICD-GPS-153 sets the common standard for PLGR and DAGR.

The **physical** interface is more variable. Depending on the dynamics of the host platform, standard PLGR installation accessories (e.g. the mount, power cable, remote antenna and cable and PLGR-PC cable) may not be sufficient. In that case, the host system provides components that compensate for the "shake, rattle and roll" of their platform. Since the DAGR is smaller than the PLGR, the physical mount will have to be replaced. The DAGR mount will use the same hole pattern as the PLGR mount so that should facilitate the installation of DAGR.

Host platform managers still have responsibility for validating DAGR backward compatibility. Details on DAGR vehicle installations will be discussed in coming issues.

Tony Callanan at Los Angeles, DSN 833-2914

Update on PLGR installations to HMMWV

Many Army users have installed PLGR to their HMMWV. Even if PLGR isn't connected to other communications equipment, using vehicle power cuts down on PLGR battery usage and the roof-mounted antenna improves satellite signal reception. In 1996, the PM for Light Tactical Vehicles (PM LTV) at Tank Automotive Command (TACOM) and AM General Inc. developed installations kits and published guidance to install PLGR to the standard hard-top and up-armored versions of HMMWV.

PM GPS wrote an information sheet based on that guidance to disseminate the TACOM kit numbers and installation instructions and a note about installing PLGR to soft-top HMMWV. TACOM is now simplifying the installation design with a kit that will accommodate installations to either soft or hard-top HMMWV. The update also addresses a safety concern about having the PLGR mounted directly in front of the passenger. The existing hard top kit can be used for soft-top installs if you substitute an improved antenna bracket like the one used by Stryker Brigade Combat Teams (SCBT).

PM GPS will update our HMMWV information sheet and post the revised TACOM guidance to the GPS website as soon as we get it. Details will be included in the next Pathfinder. At this time, TACOM does not recommend retrofit changes to existing HMMWV installations.

For more information contact one of the PM GPS offices or TACOM at the number listed below.

Mr. John Krzywiecki, (586) 753-2597 DSN 786-2597

What Happens to PLGR?

With the announcement of the DAGR production contract, users can anticipate the day when the DAGR fielding team arrives to swap out PLGR for DAGR.

The exchange process will be coordinated through the Force Modernization Office at major installations and in cooperation with Major Commands so as to minimize disruptions to ongoing unit operations.

So what happens to PLGR? First fielded in 1994, the AN/PSN-11(V) and AN/PSN-11(V)1 PLGR will remain the corner stone of handheld PPS-rated GPS service for military forces for the next few years.

PLGR replaced the pure commercial GPS receivers known as Small Lightweight GPS Receiver (SLGR) bought in haste to support Operation Desert Storm in 1991. Nearly all SLGR are now out-of-service.

Although primarily a hand-held GPS receiver, the PLGR was also connected to a wide variety of host platforms and it was installed to many vehicles as a low-cost source of reliable PPS-rated GPS data.

The PLGR provided big improvements over the SLGR: At the time, the state-of-the-art PLGR included a four line text display, the ability to track a larger number of satellites and a weight under 3 lbs.

The PLGR will be overshadowed by DAGR but will remain in service beyond the original 10-year product life cycle. PLGR will continue to provide PPS-rated GPS during the several years it takes to transition the force from PLGR to DAGR.

PLGR will be collected, repaired as appropriate and redistributed in accordance with Headquarters Army guidance to fill shortages in lower priority units. With a combination of PLGR and DAGR in the field, PM GPS anticipates achieving the objective that every military units be equipped with 100% of their authorized handheld GPS equipment. And remember, only the PLGR and DAGR are genuine PPS-rated receivers.

Units getting DAGR do not have the option of retaining PLGR and they will have to account for each PLGR before DAGR are issued.

And because PLGR has a security chip inside, the PLGR will never be disposed through DRMO. Any PLGR removed from service as a result of damage must be de-processed through the Rockwell Collins PLGR repair depot.

The Pathfinder newsletter will continue to feature articles related to PLGR operation and maintenance even as PM GPS gears up to begin fielding DAGR.

If you have questions or comments about PLGR don't hesitate to contact one of the PM GPS offices.

Suzanne Reinhardt-Smith at DSN 992-5758

Comparing PLGR to DAGR

What are the differences between PLGR and DAGR? Without going classified, here are the highlights:

1. Dual Frequency: Where PLGR operates on a single frequency, the DAGR adds a second encrypted frequency to provide a more reliable and accurate computation of the receiver's current location. The second frequency also gives DAGR greater protection from signal interference in an increasingly hostile signal environment which includes hostile attempts to disrupt or block GPS signals or broadcast false signals.

2. Security Technology: DAGR will use next-generation security technology called Selective Availability Anti-Spoofing Module or SAASM for short. SAASM will give DAGR greater anti-spoof and anti-jam protections over that available to PLGR. When fully implemented, the new security architecture using SAASM will allow for new features such as "over-the-air" re-keying to simplify soldiers workload and further increase signal security.

3. Display: The 4-line text-only PLGR display is replaced by a Graphical User Interface (GUI) display in DAGR. GUI supports digital maps and allows for quick-reference graphics for faster visualization of current position relative to map or route images. Soldiers can determine position relative to known points and azimuths on the screen.

4. All in View technology: Where PLGR was capable of viewing up to 5 satellites simultaneously, All-in-View allows DAGR to quickly shift to any available satellite such as when vehicle movement or a structure blocks signal access. It also improves a feature called "integrity" where the receiver can exclude faulty satellite signals and continue to produce a reliable accurate position location.

5. Anti-Jam Performance: The threshold for jamming resistance is increased in DAGR.

6. The Time-To-First-Fix (TTFF) and Time-To-Subsequent-Fix (TTSF): DAGR technology allows the receiver to greatly reduce TTFF and TTSF over PLGR. The faster the receiver can gain a "fix" the faster the user gets an accurate position update. This also allows you to operate DAGR for shorter periods of time thereby reducing battery demand.

7. Weight and Size: The DAGR weighs less than half the weight of PLGR and is about 2/3 the size so DAGR will fit into a closed 2 clip ammo pouch!

8. Reliability: Advances in technology move the DAGR to a projected 5,000 hours of operation between failures versus 2,000 hours for the PLGR.

9. Power Consumption: Advances in technology allow the DAGR to reduce power consumption so that the power available from standard AA cell batteries is sufficient for reliable operation. Since the AA cell which is the most common battery in use, DAGR will be more easily supplied with cheaper readily available AA cells. No more expensive and unique military-only batteries!

Okay, so the DAGR sounds like a great improvement over PLGR, when can you get one?

DAGR Fielding will be conducted in a priority sequence determined by Headquarters Dept of the Army. Right now the plan is to begin equipping the first unit about 11 months from now.

PM GPS is working to accelerate the fielding plan with a minimum impact on unit operations.

The next couple issues of Pathfinder will carry more information about DAGR fielding.

Stay tuned!

DAGR: MAJ Ryba at Los Angeles DSN 833-0595.
Fielding: Ed McAuley at Ft Monmouth DSN 992-6136.

PLGR Repair Procedures for Operation Iraqi Freedom (OIF)

The procedures for turning PLGR in for repair by units deployed to OIF has a slight new twist.

An Electronic Sustainment Support Center (ESSC) is in place to accommodate PLGR repairs. A Memorandum of Understanding (MOU) was signed between the V Corps CDR and the CECOM, Logistics Readiness Center (LRC), to establish the ESSC to expedite depot maintenance support for OIF units.

What does this mean to the soldier in OIF? Well, the new procedures for turning in faulty PLGR for repair/replacement includes Regional Support Centers (RSC) throughout the theater. An RSC has been set up in Kuwait to test, package and ship defective PLGR back to the repair depot at Rockwell Collins in Cedar Rapids, Iowa.

What should I do with a faulty PLGR?

- Zeroize your PLGR (use Menu, Do Not use Emergency zeroize function)
- Remove the prime battery (leave the memory battery installed)
- Turn the PLGR in to your Direct Support BN or Forward Support BN. (FSB)
- DS/FSB turns in PLGR to appropriate RSC (unit must have DA Form 1687, Delegation Of Authority) on DD Form 1149 and DA Form 2407.
- RSC staff performs initial inspection and Tags PLGR with DA Form 2402.
- RSC staff transport PLGR to Kuwait for shipment back to Rockwell Collins.

What happens once my PLGR is turned in?

- Rockwell Collins replaces your PLGR from a pool of ready-to-go repaired assets.
- The replacement PLGR is shipped to FT Bragg and forwarded to the Kuwait RSC.
- Kuwait RSC ensures PLGR get back to appropriate RSC for issue to owning unit. If you have any questions on the status of your PLGR, direct them to the Kuwait RSC.

Randy Robinson at DSN 992-6140

PLGR Maintenance Work Order (MWO)

In February 2003, CECOM released MWO 11-5825-291-30-4, TCTO 31R4-2PSN11-507 to update PLGR software. Initially, Army users were advised to update Standard PLGR Baseline II (tan) to version 613-9854-005 and Enhanced PLGR Baseline III & above (green) to version 613-90544-101.

The guidance was later revised to load Standard PLGR Baseline II (tan) with version 613-9854-005 and Enhanced PLGR Baseline III & above (green) with version 613-9868-008.

All software versions were included in the MWO so you only have to select the proper version to load.

Materiel Change Number (MCN) is 1-03-07-0013.

The reason for the change in the guidance has to do with the Army restriction on PLGR+96 software.

The Army initially restricted that software to approved users of the Leica Vector VIPER rangefinder. We didn't know if this new software would have any unintended impacts on PLGR used in other weapons systems. By mid-summer the Army completed testing to confirm that PLGR+96 software did not pose a risk to other weapons systems and the decision was made to standardize on PLGR+96 software, bringing Army users into alignment with Air Force, Navy and USMC users.

NOTE: The original design PLGR (standard Baseline II tan) does not have sufficient capacity to handle PLGR+96 software. That's why you always see two version of current software for PLGR, one each for standard and enhanced PLGR.

The MWO/TCTO is available at the CECOM RDIT website http://rdit.army.mil/rditindex.html. The software was also distributed on CD ROM's to MWO Coordinators and Direct Support (DS) units. Those agencies should also have PLGR reprogramming kit # 5825K3118004ANS which was distributed in the past. The kit contains the cable needed to install the software. The TCTO kit number is 5825K3118012ANS.

Software: Frank Rowe at DSN 468-9511.
Reprogramming: Ed McAuley at DSN 992-6136.

PLGR and Blue Force Tracking - FBCB2

One of the military's premiere initiatives to incorporate state-of-the-art digital technology to combat operations is the Force Battle Command Brigade and Below or FBCB2 system. Designed to provide command and control at the Brigade and lower level, FBCB2 also provides a quantum leap towards improved Situational Awareness (SA) through its real-time display of friendly forces, hence the name "Blue Force Tracking" or BFT. The standard FBCB2 system being mounted in combat vehicles consists of an FBCB2 Appliqué Computer, Kontron Computer, or FBCB2 Tough-book laptop computer integrated to a PLGR for GPS positioning data and a transceiver that utilizes satellites to maintain the communications link across the battlefield.

Shown above is the Applique Computer and on the right, the PLGR to provide GPS positional data.

So does it work? Yes! As noted in the following article, the FBCB2 system clearly demonstrated its potential in Operation Iraqi Freedom . Although there were not as many systems available as desired, FBCB2 proved its feasibility and more importantly its value to the soldiers and commanders on the ground.

In the build-up prior to Operation Iraqi Freedom, PM GPS quickly delivered additional PLGR sets to support expanded issue of FBCB2-Blue Force Tracking systems in the Army.

Maintenance Notes: FBCB2 is one of many Army weapons systems to make effective use of PLGR as a rugged source of reliable GPS data. Even so, there were some interface issues that became apparent when PLGR was installed to FBCB2. Two important points: The Hoffman plate or Ferrite beads were added to reduce potential EMI damage. Remember to retain the plate if issued when PLGR is returned for depot repair. Secondly, there is a power-up sequence to be followed so that the components do not accidentally discharge power. FBCB2 operators are familiar with the rule: Never turn the PLGR off while FBCB2 is running! Follow the right sequence when connecting/disconnecting PLGR from FBCB2. Guidance is provided in the FBCB2 operations TM. Read more about Blue Force Tracking in the following article.

POC Mr. Jeff Forgach at 732-427-2217/ DSN 987-2217

Generals Point Ways to Better Blue Force Tracking

By Matthew French, *Federal Computer Week,*

This article originally appeared in the 21 Oct 03 issue of *Federal Computer Week* and the 25 Oct 03 issue of Army Space Journal and CGSC Space News.

The military's Blue Force Tracking worked well during Operation Iraqi Freedom, but there weren't enough devices available and not enough bandwidth to support the ones that did make it to the field, the general who led the Army's V Corps during the operation told a House subcommittee today.

"On average, U.S. Army divisions that received Blue Force Tracking only got about 150 systems per division," said Lt. Gen. William Wallace, testifying before the House Armed Services Committee's Terrorism, Unconventional Threats and Capabilities Subcommittee. "That was based on limitations in satellite capability and the physical capability to produce those numbers and get them into the field."

Blue Force Tracking allows U.S. and allied leaders to keep close tabs on their forces. In its final version, it will consist of Global Positioning System (GPS) applications, communications -- most likely through the Joint Tactical Radio System -- logistics and supply, and tactical overlays.

Systems that were in place for the recent Iraqi conflict were "extraordinarily successful," said Wallace,

Blue Force Tracking (Cont'd)

now commander of the Army's Training and Doctrine Command. But bandwidth concerns were one of the largest hurdles to be overcome, he said. Satellite communications delivered Blue Force data, but commanders competed for bandwidth and the existing connectivity was largely insufficient, especially for the more mobile forces on the front lines, he said.

The Blue Force systems that were deployed were done so largely in commanders' vehicles, or reconnaissance vehicles and others assumed to be in close combat with the enemy, Wallace said. It would be more useful if all vehicles could have them, he said.

"What Blue Force Tracking did not do, because of the level of fielding, is give individual vehicle views because of its thin fielding," he said. "Blue Force Tracking provides the ability to deny fires to occur, but it doesn't clear fires. Because of that, there's going to have to be some kind of identify friend or foe system that compliments Blue Force Tracking."

Marine Maj. General Keith Stalder, deputy commanding general of the 1st Marine Expeditionary Force, said his Marines had two systems in the desert: Blue Force Tracking and the Marines' Mounted Digital Automated Communications Terminal (MDACT).

Stalder said he deployed 319 MDACT units and 177 Blue Force devices to Marine units, and 47 Blue Force devices to United Kingdom units.

"That coverage allowed us to function and operate much in the same manner as our colleagues in V Corps," Stalder said. We pushed "those systems to the most forward elements and those elements that might come in contact with the enemy in a situation where it required us to add as much situational awareness as possible."

Individual shooters still make the decisions on engaging targets, but a system that clearly distinguishes between friend and foe would help. But Blue Force, Stalder said, lacks fidelity -- the ability to be accurate 100 percent of the time.

Lt. Gen. Daniel Leaf, vice commander of Air Force Space Command, said top Air Force officials have ordered improvements in Blue Force Tracking deployments in future operations.

"Because of its potential, the secretary of the Air Force (James Roche) and the chief of staff of the Air Force (Gen. John Jumper) visited Air Force Space Command some weeks ago and gave us strong direction to look at how we can improve, enhance and expand the role of Blue Force [Tracking] as part of our overall situational awareness," Leaf said.

(Editor's Note: The Blue Force Tracking devices mentioned above are Grenadier BRAT devices.)

To request email distribution of the Army Space Journal contact Jeff Barker at Command & General Staff College, Fort Leavenworth, KS.

barkerj3@leavenworth.army.mil

How To Contact PM GPS

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New Jersey Office for Army Readiness Management (RMD): DSN 992-6133 or 6137 CML (732) 532-6133 or 6137. Email: Dennis.Rotenberry@iews.monmouth.army.mil Donald.Mulligan@iews.monmouth.army.mil

Georgia Field Office (GFO) for Joint Service Sustainment: DSN 468-3288 or 3518 CML (478) 926-3288 or 3518. Email: Johnny.Walker@ROBINS.AF.MIL Willie.Jackson@ROBINS.AF.MIL

Who to Call?

For information about the GPS Space and Control Segments, weapons system integration and new products, call California.

For sustainment support including software, supply issues, technical publications and accessories, call Georgia.

For equipment authorizations, Deferred Maintenance, fielding, host vehicle installations and New Equipment Training, call New Jersey.

Not sure? Visit the Army GPS website at: http://ARMY-GPS.ROBINS.AF.MIL or

contact the Pathfinder editor: Donald.Mulligan @iews.monmouth.army.mil

The Evolution of Hand-held Military-rated GPS Receivers

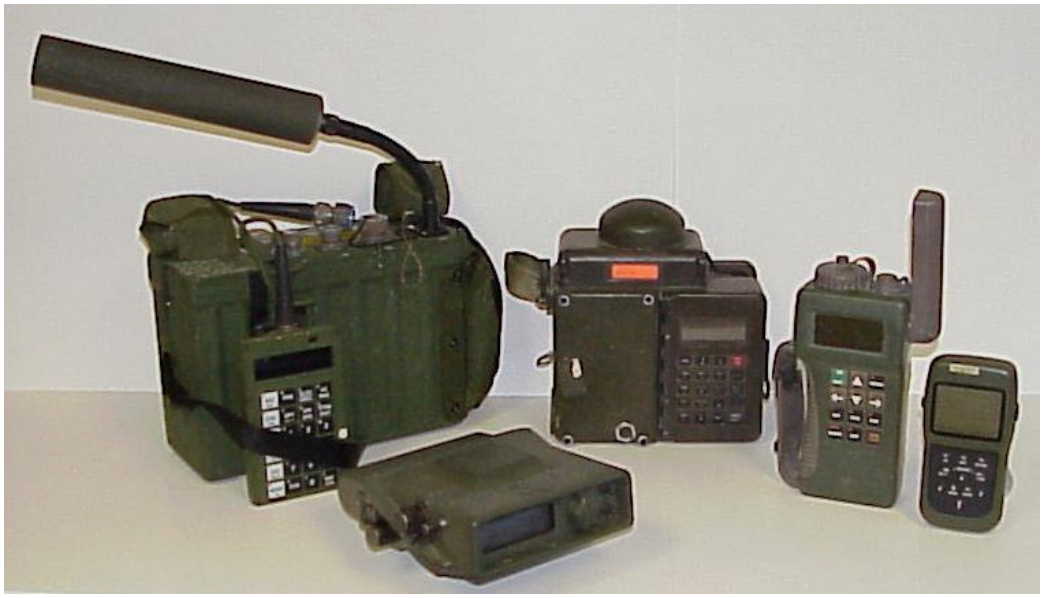
Since 1988 when the first man-portable GPS set was introduced, User Equipment has steadily evolved, always putting greater performance into smaller and lighter receiver designs. The next-generation Precise Positioning Service (PPS) rated GPS receiver, the Defense Advanced GPS Receiver (DAGR) will enter service in 2004.

From the left, the 17lb AN/PSN-8 backpack and the 10lb AN/PSN-9 portable.

In front of them is the 4 lb AN/PSN-10 handheld, also known as SLGR.

Right of center is the current handheld PPS-capable design, the 3 lb AN/PSN-11(V)1 PLGR.

At the extreme right is the new state-of-the-art DAGR, a high-performance PPS-capable design weighing in at one lb including batteries and small enough to fit in a closed 2-clip ammo pouch!



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